

5.8 Radical Equations and Inequalities

radical equations--equation with a radical containing variables in the radicand

ex: $\sqrt{2x-1} = 3$

$$2x-1 = 9$$

$$2x = 10$$

$$x = 5 \checkmark$$

Steps

1. Isolate the radical
2. "Square" both sides
3. Solve for x
4. Check

ex: $2\sqrt[3]{x} - 1 = 3$

$$\sqrt[3]{x} = 2$$

$$x = 8$$

$$x = 8 \checkmark$$

ex:

$$3x - 5\sqrt{x} = 2$$

$$-2 + 5\sqrt{x} = -2 + 5\sqrt{x}$$

$$(3x-2)^2 = (5\sqrt{x})^2$$

$$9x^2 - 12x + 4 = 25x$$

$$9x^2 - 37x + 4 = 0$$

$$(x-4)(9x-1) = 0$$

$$x = 4$$

$$x = \frac{1}{9}$$

$$\{4\}$$

Check: $\frac{12}{3} - \frac{10}{3} = 2 \checkmark$ (4) $\frac{5}{3} - \frac{5}{3} \neq 2$ ✗

~~$\frac{36}{-36} - \frac{-1}{-37}$~~

Do:

$$\sqrt{7x-12} = x$$

$$7x-12 = x^2$$

$$0 = x^2 - 7x + 12$$

$$0 = (x-4)(x-3)$$

$$x=4 \quad x=3$$

$$\begin{array}{c} 12 \\ -4 \quad -3 \\ \hline -7 \end{array}$$

$$x-4=0 \\ x=4$$

Double Check $\frac{4}{9} + \frac{45}{9} = 5$ $\frac{2}{9} + \frac{3}{3} = 2$ Instead of isolate put a radical on each side

$$\text{ex: } \sqrt{2x+5} = 2\sqrt{2x+1}$$

$$2x+5 = (2\sqrt{2x+1})^2$$

$$2x+5 = 8x+4\sqrt{2x+1}+1$$

$$-6x+4 = 4\sqrt{2x+1}$$

$$(-3x+2)^2 = (2\sqrt{2x+1})^2 \quad \div 2$$

$$9x^2 - 12x + 4 = 8x$$

$$9x^2 - 20x + 4 = 0$$

$$(9x-2)(x-2) = 0$$

$$x = \frac{2}{9} \quad x = 2$$

Do:

$$\sqrt{2x-2} - \sqrt{x+6} = 1$$

Inequalities

ex:

$$\sqrt{3x+6} + 2 \leq 5$$

$$\sqrt{3x+6} \leq 3$$

$$3x+6 \leq 9$$

$$3x \leq 3$$

$$x \leq 1$$

1 Restriction

$$3x+6 \geq 0$$

$$3x \geq -6$$

$$x \geq -2$$



Test 0

Test 1/2

$$-2 \leq x \leq 1$$

ex: $6 - \sqrt{2x+1} < 3$

$3 < \sqrt{2x+1}$

$9 < 2x+1$

$8 < 2x$

$4 < x$

Restr.

$2x+1 \geq 0$

$2x \geq -1$

$x \geq -\frac{1}{2}$

Test 0

Test 12 ✓

$x > 4$

HW

p266

15, 17, 23, 27, 30, 33, 35